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SHARKS, AND SKATES OR RAYS

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The sharks and skates or rays are known to the ichthyologist as Elasmobranchs and also as Selachians. They differ from the bony fishes or Teleosts in having cartilaginous instead of bony skeletons. Furthermore, the skull is without sutures and without membrane bones, such as opercles and preopercles; the upper jaw is not fused with the skull; and five to seven gill slits, which are openings in the skin, are present at the side of the head or under the posterior part of it. Ventral fins are present and are attached to the abdomen and in males are provided with elaborate cartilaginous appendages, known as claspers. In general, the fishes of this group are considered primitive, dating back in geological time to the carboniferous or coal measures period.

Most sharks are shaped more or less like such common fishes as the mackerels, the codfishes, and the herrings. The body is more or less rounded; the head generally is pointed, and the mouth commonly is under the snout. One or two dorsal fins are well developed; a well developed caudal fin, with the upper lobe much the longer, is present; the paired fins (pectorals and ventrals), too, are well developed, and free from the body; and the gill slits are lateral and generally vertical. "Typical" skates or rays, on the other hand, are greatly depressed; the head is variously shaped, though generally strongly depressed; and the mouth usually is under the snout as in the typical sharks; the tail is slender, and it may be short or long or even whip-like. Dorsal fins, if present, are small; the caudal fin is small or wanting; the anal fin is missing; the paired fins are well developed, the pectoral being broad and is commonly attached to the head and body forming with them a more or less definite disk; and the gill slits are below the disk and are horizontal.

Unfortunately, the distinctions between the sharks and the skates or rays are not as clear-cut as indicated by their more or less typical forms, for there are groups that are intermediate, and possess characters showing an almost complete intergradation. The angel sharks (Squatenidae) and the safishes (Pristidae), although usually classed with the skates or rays (Batoidei) because of certain osteological characters, are definitely intermediate in form and shape, and more important in the position of the gill slits, which are neither wholly lateral nor wholly ventral. The position of the gill slits is important

because it constitutes the only character externally visible that generally distinguishes the sharks from the skates or rays, the other characters being highly technical bone structures. In general, it may be said then that except for a few intermediate forms, sharks have lateral gill slits, whereas skates or rays have ventral (inferior) gill slits.

Nearly all sharks and skates are well provided with teeth, generally with several series in each jaw. In most species of sharks the teeth are shaped more or less like sawteeth, and obviously are used for cutting. In some skates they are short and blunt and sometimes are arranged like the bricks in a sidewalk. Such teeth clearly are used for crushing hard objects. The teeth are set in the gums (not in sockets in the jaw bones) and develop and fall away more or less continuously.

Elasmobranchs are oviparous or viviparous, that is, they either lay eggs or produce live young. In the case of the sharks and skates or rays the eggs are fertilized internally even though some are hatched externally. The eggs that are left to develop in the sea are mostly large and are enclosed in a tough horny case, variable in shape. Many cases are quadrangular, with each corner provided with a sharp spine with or without tendrils. The tendrils, if present, become coiled around seaweeds stones or other fixed objects in the water to serve as anchors during incubation. Those not provided with tendrils of course drop loose in the water. The egg cases are often cast up on the beach and known as sailor's purses, mermaid's purses, and by several other names. The bullhead sharks of the Pacific have an egg case of unique shape, being in the form of a cone and having very thick walls, provided with two broad flanges twisted spirally around it. The young hatched from such large eggs as have been described are well developed, and well able to lead an independent existence upon hatching. Similarly, the young that are born alive are large, rather fully developed, and quite able to take care of themselves at birth. As usual among the fishes that are well developed when hatched or born, the number of eggs or young produced is small, consisting among the sharks and skates or rays of one to perhaps at most a dozen.

Some sharks and skates or rays reach a very large size. The whale-shark (Rhineodon typicus) of almost world-wide distribution, for example, reaches a length of upward of 30 feet and individuals 60 feet long have been reported. Some of the skates, too, grow very large. The devilfish (Manta birostris) of both coasts of America, for example, is reported to reach a width of upward of

20 feet and a weight of several tons. However, there are many exceptions, as some of the species are quite diminutive. The common spiny dogfish (Squalus acanthias) of the North Atlantic, for example, reaches a length of only about 2 to 3 feet, and the common skate (Raja erinacea) of the Atlantic Coast of America, attains a length of only about 16 to 20 inches, and many others are even smaller.

Sharks and skates or rays, formerly of little value, are increasing in economic importance, as the fins and flesh are used to a greater extent. Sharks, in particular, have increased greatly in value because of the discovery that the livers of some of the species, especially the soupfin shark (Galeorhinus zyopterus) of the Pacific Coast of America, are very rich in vitamin A content. The, too, the hides of some of the sharks have been found to make a very good grade of leather, and accordingly are caught for their skins and their livers. Formerly, and even now, some fishermen engaged in catching food fishes find the sharks a nuisance. This is especially true on the Atlantic Coast of the United States during the spring migrations of the small dog sharks or dogfish, which do great damage to fish nets and have little or no sale value. The stingrays, too, are considered a nuisance because of their serrated, poisonous tail spines, with which they sometimes inflict very painful and dangerous wounds.

Most sharks and skates or rays feed on fish, which are run down through superior strength and activity. To this there are many exceptions. The large whale shark and the basking shark are examples of large sharks that feed on small organisms, generally not more than a few inches in length. The skates or rays mostly feed on the bottom and commonly on crustaceans and mollusks, though some of the species include fish in their diet.

That some species of sharks occasionally attack men is an established fact. However, authentic observations are not very numerous and in the tropics some of the attacks ascribed to sharks probably should be credited to barracudas. All sharks, of course, are not dangerous to man. The whale-shark, the largest fish known, for example, is perfectly harmless, as already indicated. In general, however, it is wisest to forego bathing or wading where sharks are present, as hunger sometimes makes shy animals quite bold.

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